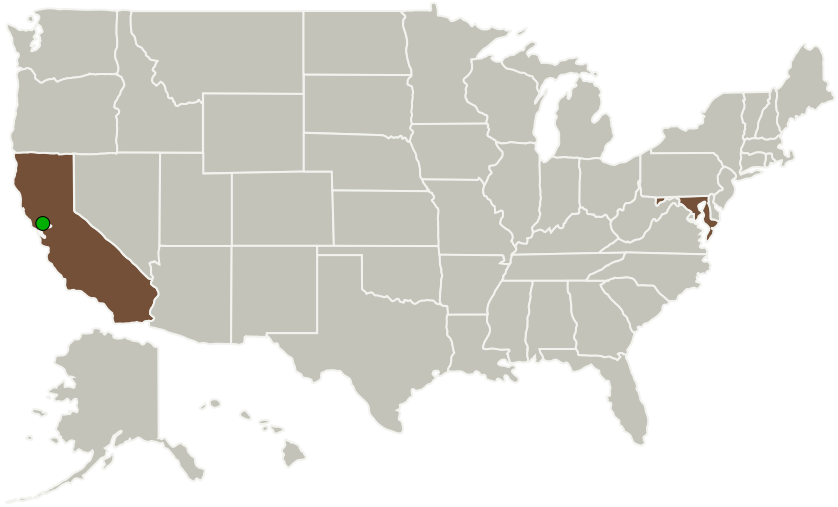
Improved CDGPS FDIR Using Comm-based Relative Measurements, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

The proposed innovation is to use the comm-based measurements available from many advanced satellite cluster wireless networks to improve the flexibility and robustness of relative and absolute navigation systems without the additional expense, weight and power that a traditional navigation backup systems (like an extra GPS receiver) would require. This will be accomplished by comparing the range, range-rate or angle measurements predicted by GPS-based navigation solutions to the actual measurements obtained from the communication system. By monitoring these parity equations and the innovations of the GPS filters, FDIR can be significantly improved. These parity relations between redundant range measurements create a more sensitive residual than filter-based residuals because most filters naturally mask the faults. Recovery to GPS failure can be accomplished by relying on the comm measurements themselves to maintain relative state observability. Attempted recovery of GPS or other strategies can then be implemented without requiring the cluster to disperse. By building off of Carrier-phase Differential GPS (CDGPS) navigation filters and cluster flight simulations currently being built by Emergent under its DARPA System F6 contract, we will demonstrate the effectiveness of this FDIR technique in simulation.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Emergent Space Technologies, Inc.	Lead Organization	Industry	Greenbelt, Maryland
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Maryland

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138626)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Emergent Space Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

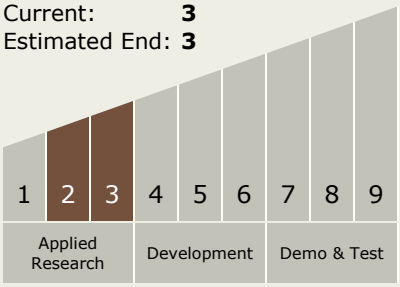
Carlos Torrez

Principal Investigator:

Matthew C Ruschmann

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.5 GN&C Systems Engineering Technologies
    - TX17.5.2 GN&C Fault Management / Fault Tolerance / Autonomy

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System